

REMARKS

Applicants have studied the final Office Action dated July 30, 2004 and have made amendments to Claim 1. It is submitted that the application, as amended, is in condition for allowance. Claims 20-26 have been added. By virtue of this amendment, claims 1-10, 15 and 17 and 20-26 are pending. Reconsideration and allowance of the pending claims in view of the above amendments and the following remarks is respectfully requested.

In the Office Action, the Examiner:

- (1-2) Rejected claims 1, 2, 4, and 17 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) in view of Jang et al. (U.S. 5,637,529);
- (3) Rejected claims 3 and 5 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2, above and further in view of Tan et al (US 6,001,706);
- (4) Rejected claims 6-10 and 15 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2 above, and further in view of Lill et al. (U.S. 6,074,954) and in view of Numazawa et al. (U.S. 6,168,996); and
- (5-6) Rejected claims 1-10, 15, and 17 under judicially created doctrine of obvious-type double patenting as being unpatentable over 13-19 of co-pending Application No. 10/466,145.

(1-2) Rejection under 35 U.S.C. §103(a) in view of Kircher and Jang

As noted above, the Examiner rejected claims 1, 2, 4, and 17 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) in view of Jang et al. (U.S. 5,637,529). Independent claim 1 has been amended to distinguish over Kircher taken alone and/or in view of Jang.

On page 8 of the Office Action, the Examiner states in paragraph 1 (emphasis in the original), *"In response to applicant's argument that the reference fail to show certain*

features of applicant's invention, it is noted that the features upon which the applicant relies (i.e. where the amorphous material is deposited directly on the substrate") are not recited in the rejected claim(s)." The Applicants have amended independent claim 1 to clarify over Kircher by reciting:

c) depositing a layer of amorphous material having the same chemical composition as that of the substrate directly on a structure obtained after amorphizing in step b;

Likewise, newly added independent claim 20 recites

depositing directly on the substrate depositing directly on the substrate after amorphizing the single-crystal lattice, a layer of amorphous material having the same chemical composition as that of the substrate;

Support for this amendment is found at page 2, lines 10 through page 4, line 25 of the specification of the present invention as originally filed. No new matter has been added.

Kircher discloses a method for making a three-dimensional transistor cell arrangement. A trench 2 is etched in a highly doped silicon substrate 1. The trench is then filled with highly doped (arsenic) polycrystalline silicon 5. The polycrystalline silicon 5 serves as an electrode for the charge storage. The polycrystalline silicon 5, that fills out the trench 2, is etched back, creating a depression (illustrated by the arrow 6). A silicon oxide 7 that functions as an insulation between the trench capacitor (1, 4, 5) and the later selection transistor is introduced, by deposition of the vapor phase (CVD), into the hole (6). After planarization from the surface, a polycrystalline silicon or, respectively, an amorphous silicon 8 lightly doped with boron is deposited on the surface of the substrate. According to an alternative of the method, layer 8 recrystallizes during heating to temperatures of approximately 550°C to about 660°C (column 3, line 4 to col. 4, line 20, FIGs. 1 to 5).

As the Examiner correctly states on page 2 of the Office Action, *Kircher does not teach amorphizing the single crystal lattice of substance around a periphery of the recess and*

the Examiner goes on to combine Kircher with Jang.¹ Kircher expressly teaches to deposit the amorphous layer 8 on the isolating silicon oxide layer 7, and not directly on the substrate 5. Combining the teaching of Kircher and with the method according to Jang as suggested by the Examiner, one skilled in the art could not deposit a layer of amorphous material directly on the amorphized structure (amorphized substrate) as recited in independent claim 1 of the present invention. Accordingly, the present invention distinguishes over Kircher taken alone and/or in view of Jang for this reason.

Further, Kircher expressly teaches depositing the amorphous layer 8 on an isolating silicon oxide layer 7, and not directly on the substrate 5. By combining the teachings of Jang and Kircher, it is not possible for one skilled in the art to deposit a layer of amorphous material on an amorphized structure. In the present invention, the annealing of an amorphous material made of an amorphized structure covered with a layer of amorphous material leads to the obtaining of a substrate with a single-crystal lattice which makes it possible to repair the local defects, to ensure planarity and surface homogeneity allowing the formation of an epitaxial layer of silicon free of crystal defects. See page 2, lines 10 through page 4, line 25 of the specification of the present invention as originally filed. In contrast, Kircher is completely silent on a substrate with a single-crystal lattice. Kircher teaches a method to provide a transistor cell arrangement with a low area requirement per cell.

The objective of Jang is to provide a method for forming an element isolation insulating film of semiconductor devices which can reduce junction leakage current. Also Jang teaches a method for removing the lattice defects, thereby improving the yield and productivity of semiconductor devices (See Jang at col. 1, lines 45-50). In particular, Jang teaches that the implantation of germanium impurities in a trench, to form an amorphous region, leads to the removing of the lattice defects occurring upon forming the trench (col. 4, claim 1). The semiconductor substrate is then recovered by

¹ Applicants make no statement on whether such combination is even proper.

crystallizing the amorphous region by a solid phase epitaxy process (col. 2, lines 52-54, claim 1).

In contrast, independent claim 1 of the present invention recites:

c) depositing a layer of amorphous material having the same chemical composition as that of the substrate directly on a structure obtained after amorphizing in step b; and

d) thermally annealing the amorphous material so as to be continuous with the single-crystal lattice of the substrate.

The annealing of an amorphous material is made on an amorphized structure directly covered with a layer of amorphous material. The process of the present invention yields a substrate with a single-crystal lattice which makes it possible to repair the local defects. Further, by forming the single-crystal lattice structure the present invention ensures planarity and surface homogeneity allowing the formation of an epitaxial layer of silicon free of crystal defects (See the present invention at page 2, lines 7-14).

The Federal Circuit has consistently held that when a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such a proposed modification is not proper and the *prima facie* case of obviousness can not be properly made. See *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Here the intent, purpose and function of Kircher taken alone and/or in view of Jang as cited by the Examiner is depositing a layer of amorphous material on a crystallized structure, where the amorphous layer is deposited on an isolating silicon oxide layer. In contrast, the present invention recites "*depositing a layer of amorphous material having the same chemical composition as that of the substrate directly on a structure obtained after amorphizing in step b.*" In the present invention, the annealing of an amorphous material is made after a layer of amorphous material is directly deposited on the amorphous structure. The process of the present invention results in a single-crystal lattice which makes it possible to repair the local defects, to ensure planarity and surface homogeneity, and to provide the formation of an epitaxial layer of silicon free of crystal defects. The modification of Jang as suggested by the Examiner, completely destroys the express purpose of Jang of

depositing amorphous material on an isolating silicon oxide layer. Accordingly, independent claim 1 distinguishes over Kircher taken alone and/or in view of Jang for at least this reason as well.

Further newly added claim 20 recites a similar limitation to independent claim 1 of:

depositing directly on the substrate, a layer of amorphous material having the same chemical composition as that of the substrate on a structure obtained after amorphizing;

Accordingly, independent claim 20 distinguishes over Kircher taken alone and/or in view of Jang for at least these reasons noted above as well.

For the foregoing reasons, independent claims 1 and 20, distinguishes over Kircher taken alone or in view of Jang. Claims 2, 4, and 17 and 21-26 depend from independent claims 1 and 20. Since dependent claims contain all the limitations of the independent claims, claims 2, 4 and 17 and 20-26 distinguish over Kircher in view of Jang, as well, and the Examiner's rejection should be withdrawn.

(3) Rejection under 35 U.S.C. §103(a) in view of Kircher, Jang and Tan

As noted above, the Examiner rejected claims 3 and 5 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2, above and further in view of Tan et al (US 6,001,706).

For the foregoing reasons in the section above entitled "(1-2) Rejection under 35 U.S.C. §103(a) in view Kircher and Jang", independent claim 1, as clarified by amendment, distinguishes over Kircher and/or in view of Jang and/or in view of Tan because Kircher, Jang, and Tan are silent on "*depositing a layer of amorphous material having the same chemical composition as that of the substrate directly on a structure obtained after amorphizing in step b.*" Claims 3 and 5 depend from claim 1. Since dependent claims contain all the limitations of the independent claims, claims 3 and 5 distinguish over Kircher and/or in view of Jang and/or in view of Tan.

(4) Rejection under 35 U.S.C. §103(a) in view of Kircher, Jang, Lill, and Numazawa

As noted above, the Examiner rejected claims 6-10 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2 above and further in view of Lill et al. (U.S. 6,074,954) and in view of Numazawa et al. (U.S. 6,168,996). Independent claim 1 has been amended to distinguish over Kircher and/or in view of Jang and/or in view of Lill and/or in further view of Numazawa.

For the foregoing reasons in the section above entitled "(3) Rejection under 35 U.S.C. §103(a) in view Kircher and Jang", independent claim 1, as clarified by amendment, distinguishes over Kircher and/or in view of Jang and/or in view of Lill and/or in further view of Numazawa because Kircher, Jang, Lill and Numazawa are silent on *"depositing a layer of amorphous material having the same chemical composition as that of the substrate directly on a structure obtained after amorphizing in step b."* Claims 6-10 and 15 depend from claim 1. Since dependent claims contain all the limitations of the independent claims, claims 6-10 and 15 distinguish over Kircher and/or in view of Jang and/or in view of Lill and/or in view of Numazawa as well.

(5-6) Rejection Under Obvious-Type Double Patenting

As noted above, the Examiner rejected claims 1-10, 15, and 17 under judicially created doctrine of obvious-type double patenting as being unpatentable over 13-19 of co-pending Application No. 10/466,145. Although the Applicants respectfully disagree with the Examiner's rejection, the Applicants have elected to file a Terminal Disclaimer solely for the purpose of expediting the patent application process in a manner consistent with PTO's Patent Business Goals (PBG), 65 Fed. Reg. 54603 (September 8, 2000). Accordingly, with the submitted terminal disclaimer, the Examiner is respectfully requested to withdraw the rejection the judicially created doctrine of obviousness-type double patenting.

CONCLUSION

The remaining cited references have been reviewed and are not believed to affect the patentability of the claims.

In this Response, Applicants have amended certain claims. In light of the Office Action, Applicants believe these amendments serve a useful clarification purpose, and are desirable for clarification purposes, independent of patentability. Accordingly, Applicants respectfully submit that the claim amendments do not limit the range of any permissible equivalents.

Applicants acknowledge the continuing duty of candor and good faith to disclosure of information known to be material to the examination of this application. In accordance with 37 CFR §1.56, all such information is dutifully made of record. The foreseeable equivalents of any territory surrendered by amendment is limited to the territory taught by the information of record. No other territory afforded by the doctrine of equivalents is knowingly surrendered and everything else is unforeseeable at the time of this amendment by the Applicants and their attorneys.

Applicants respectfully submit that all of the grounds for rejection stated in the Examiner's Office Action have been overcome, and that all claims in the application are allowable. No new matter has been added. It is believed that the application is now in condition for allowance, which allowance is respectfully requested.

PLEASE CALL the undersigned if that would expedite the prosecution of this application.

Respectfully submitted,

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